

NUCLEAR DATA FOR IMPROVED LEU-LWR REACTIVITY PREDICTION

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Subgroup 22 of the Working Party on International Nuclear Data Evaluation Co-operation (WPEC) has been set up to investigate the reasons for the systematic reactivity underprediction of thermal LEU-LWR (Low Enriched Uranium, Light Water Reactor). This k_{eff} underprediction ($\approx 0.5\%$) is observed with the most recent nuclear data libraries (ENDFB/VI.8, JENDL3.3 and JEFF3.0). A special mailing list called **ueval** has been created to collect contributions on this subject. (see the website at www.nea.fr/lists/ueval).

The aim of this paper is to summarize the work done. Activities were restricted to the improvement of reactivity prediction of system using fresh uranium fuel (i.e the problem of k_{eff} prediction during depletion was not investigated). This collective work was based on several assumptions :

- The observed k_{eff} is not likely the consequence of numerical approximations in reactor calculation methods. This point was checked using Monte-Carlo approach and accurate pointwise representation of nuclear data.
- Given the number of experiments investigated (mostly from the ICSBEP handbook) and the different kinds of experimental methods used to achieve critical state, the present reactivity bias is not believed to come from experimental errors in criticality measurements.

The Working Group focused on nuclear data evaluations of main isotopes impacting thermal benchmarks calculations : U235, U238, H2O and O16. The following specific points have been studied :

- Following the work of the WPEC/Subgroup 4, new preliminary improved evaluations of U238 inelastic data have been distributed and tested against integral benchmarks.
- The thermal capture cross-section of U238 has been revisited, new resonance parameters of U238 have been proposed for testing purpose. Tests have ensured that the modifications of U238 capture cross-section in the thermal and resolved range were still compatible with U238 integral measurements (U238 capture rate ratios measured in critical facilities and Pu239 build-up prediction in depleted PWR assembly).

After a continuing effort to test successive versions of those preliminary nuclear data files, it has been demonstrated that a significant improvement of LEU-LWR reactivity prediction is achieved without worsening the prediction of other systems (such as intermediate spectra, highly enriched uranium systems). Work is still needed to test the performance of these new data at a larger scale using a broader range of benchmarks (especially in the fast neutron spectrum).

The provisional conclusions of this collective work are expected to contribute towards the improvement of the future versions of nuclear data Libraries. Recommendations concerning the needs for integral and experimental measurements are provided and topics for future investigation are also suggested.

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